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ABSTRACT

This book brings Alaskan Native understanding of science and ecology to the elementary classroom by showing teachers how to present local and ecosystem knowledge held by long-time inhabitants of southeast Alaska. The goal is to increase the self-esteem of Native students who traditionally perform low in science and to introduce non-Native students to this type and value of knowledge. Following the introduction, three core chapters cover the moon, tide, and cycles of life. Each of these core chapters starts with the Tlingit words relevant to the chapter's contents. Chapter 1 lays the foundation for the curriculum's theme, and each chapter thereafter builds upon it. In addition, each chapter becomes more complex. The lessons can be used (or modified for use) at several grade levels, depending on student abilities and the school curriculum. (WRM)

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TLINGIT

MOON & TIDE

Teaching Resource: Elementary Level

ED 431 634

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By Dolly Garza

University of Alaska Sea Grant

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MOON & TIDE

Teaching Resource: Elementary Level

Tlingit (Lein-Git): Tide People

By Dolly Garza

University of Alaska Sea Grant
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To the Teacher

Chapter 1 provides an introduction to this book and to teaching Alaska Native science. Chapters 2, 3, and 4 are the core units covering the moon, tide, and cycles of life.

Each of these three core chapters starts with the Tlingit words relevant to the chapter's contents. Local elders provided the correct words and spellings for Tlingit and Haida, and the *English-Tlingit Dictionary* was used as an authority. There are local variations in words, pronunciations, and spellings within the Tlingit community, so the teacher must be aware and accept word variations that community members may offer.

Chapter 1 lays the foundation for the curriculum's theme, and each chapter thereafter builds upon it. In addition, each chapter becomes more complex. The lessons can be used (or modified for use) at several grade levels, depending on student abilities and the school curriculum.

Chapter 2 lessons are best carried out in the fall when the sky is still dark during morning school hours.

Chapter 3 lessons are best carried out in the spring when the tides are low in early to mid-morning.

Chapter 4 has a seasonal or year-round study activity.

The lessons can be used by southeast Alaskan teachers or easily modified for use in other areas of Alaska. Teachers in the Eyak, Supiak, or Aleut regions can substitute language, calendars, and even legends and still provide students with the same blend of Native and Western education. The book is intended for use by Native and non-Native teachers of Native and non-Native students.

Chapter 1
Native Science in Education

Overall Goal

The goal of the *Moon and Tide* curriculum is to bring Alaska Native science and ecological understanding into the elementary classroom to:

1. Increase the self-esteem of Native students who traditionally perform low in science, and
2. Introduce students to this type and value of knowledge.

This material is presented at the elementary level where children often establish lifelong beliefs and values, and is intended to help students develop respect for Tlingit.

Native knowledge is important to both Natives and communities at large as mainstream America comes to terms with our dependence on a "healthy earth." Indigenous knowledge has been used for thousands of years by cultures around the world to survive in their environments. Inuit people in the north adapted to cold conditions and long winters; Hawaiians developed a cycle of living that allowed them to survive constant heat. The Native people of the northwest (from Washington to the Gulf of Alaska) live in a mild environment that supports a diversity of aquatic and land animals. These ideal environmental conditions allowed Native peoples to develop elaborately structured cultures.

One hundred years ago, acculturation and Christianity turned Alaska Natives away from their language, beliefs, and life ways. Although there has been significant acculturation, many traditional Native values are still deeply rooted in contemporary concepts and lifeways. This change in lifeways, and in some instances values, has led to confusion and a loss of self-esteem in the Alaska Native who is still learning to balance traditional and western ways. Teaching Native culture helps reinforce identity and security in Native students who know they are different from the average student, or who have been taught that being Native means being less.

We believe that developing a personal relationship between the school system and the Native student at an early age greatly enhances learning throughout the school years.

I am a man of the People of the Tides. The sea is as much a part of me as the land which my God has allowed me to use, and for which I am under a sacred trust to protect and preserve for my nephews—just as my uncle did for me...The tide, sun, moon and the wind share a major part in governing the actions of the Indian Nation in their day-to-day activities.

—Dr. Cyrus Peck
(Peck 1975)

Overview

Indian studies programs began in the early 1970s with cultural activities such as beading and dancing. They did not focus on the value and knowledge base of the culture as a whole. This curriculum strives to reach beyond the initial attempts of early Indian education programs by providing local and ecosystem knowledge held by these long-time inhabitants of southeast Alaska.

It is not the intent of this book to "westernize Native knowledge." Although the book does address state and federal science standards for elementary levels, Native knowledge must be presented in the Native way. Until recently, "other ways" of thinking and doing science have been largely discounted by Euro-American scientific and educational communities. In the past few years, scientists have acknowledged the value of local and traditional knowledge and the need to assess or observe an ecosystem when studying science.

Cycles including the moon and tides in southeast Alaska is the central theme of this curriculum. By observing changes in the shape of the moon and the rhythmic changes in the tides, children will learn to identify patterns in change.

Standards

Educational standards are back in vogue. A standard is something established to measure a level of adequacy or attainment. Native, state, and federal education standards are presented here. In addition, schools and communities will have their own written and unwritten school and community standards. This curriculum attempts to meet several—although certainly not all—cultural, state, and national standards.

Alaska Native Cultural Standards

At its spring 1998 annual convention, the Alaska Native Education Association approved *Alaska Standards for Culturally Responsive Schools* (Alaska Native Knowledge Network 1998). The standards were developed by Alaska Native educators to provide a way for schools and communities to examine the extent to which they are attending to the educational and cultural well-being of the students in their care. These "cultural standards" are predicated on the belief that a firm grounding in the heritage language and culture indigenous to a particular place is a fundamental prerequisite for the development of culturally healthy students and communities.

The standards are applicable to all students and communities and focus on in-depth study of the surrounding physical and cultural environment. We must recognize the unique contributions that indigenous people, as long-term inhabitants with accumulated ecosystem knowledge, provide.

Standards have been drawn up in five areas: (1) students, (2) educators, (3) curriculum, (4) schools, and (5) communities. The focus shifts the curriculum from teaching and learning about cultural heritage as another subject, to teaching and learning in the local culture as a foundation for all education. It is intended that all forms of knowledge, ways of knowing, and world views be recognized as equally valid, adaptable, and complementary (Alaska Native Knowledge Network 1998).

The cultural standards are not intended to be inclusive, exclusive, or conclusive, and thus should be reviewed and adapted to fit local needs. The standards encourage schools to nurture and build upon the rich and varied cultural traditions that continue to be practiced in communities throughout Alaska.

This curriculum addresses Tlingit expectations of a child who should know and respect her or his place relative to the world by this age level. Students will recognize that in the Tlingit world, all things are connected—the moon, the tides, the living beings of the world, the rock, the tree. Students should come to realize that Tlingit people are well attuned to the moon and tide cycles that guide many activities. People living in southeast Alaska depend upon these cycles for food, work, and transportation.

State of Alaska Science Standards

The curriculum materials generally address several of the Alaska science content standards, which encourage inquiry and an understanding of the nature and history of science. The State of Alaska content standards were developed over several years and, while not state mandated, are intended to guide schools in developing adequate curriculum plans. These four science content standards cover: (A) scientific facts, concepts, principles, and theories; (B) scientific inquiry; (C) the nature and history of science; and (D) scientific application (Alaska Department of Education 1996). This curriculum addresses several of the points of understanding, including:

- A.4: Understand observable natural events such as tides … and moon phases….
- A.15: Use science to understand and describe the local environment.

- B.1: Use scientific processes—observation, measure, interpret, infer, communicate, and predict.
- C.4: Understand that some personal and societal beliefs accept nonscientific methods for validating knowledge.
- D.1: Apply scientific knowledge and skills to understand issues and everyday events.

National Science Standards

While it is important to teach science at early grades, teachers should emphasize the experiences of investigation and explanation over scientific theory and fact (National Research Council 1996). The National Research Council (NRC) developed national science standards that are not mandatory but also provide guidance to schools and teachers as they develop K–12 school curricula.

The *Moon and Tide* curriculum addresses several of these national science standards for grades K–4.

- For content standard A, which focuses on scientific inquiry (asking and answering questions), observation is combined with what students already know to help explain what they see.
- For content standard B, which addresses the position and motion of objects relative to other objects, the tide's motion can be tracked and measured over time.
- For content standard D (objects in the sky and changes in earth and sky), students will learn to identify sequences of change in both moon and tide and look for patterns in these changes.
- Under content standard G, students will understand, by looking at Alaska Natives' views of the moon and tides, that science and technology have been practiced by people for a long time.

Worldview

"The curricula, teaching methodologies, and often the teacher training associated with schooling are based on a worldview that does not always recognize or appreciate indigenous notion of an interdependent universe and the importance of place in their societies" (Kawagley and Barnhart 1997). With a focus on Western science, "Indigenous views of the world and approaches to education have been brought into jeopardy" (Kawagley and Barnhart 1997).

In the Tlingit view, all things of the world have a spirit and are equal to humans in importance. One must understand the

relationships between all these (ecosystem studies) and must respect these relationships and resources. As a young person grows, he must understand these relationships and respect the resources to ensure a good life for him and his family.

Traditional education was carefully constructed around observation and inquiry as a means of survival. People across the globe have flourished in their ancestral lands because they had the knowledge and skills to survive in their environments through daily, monthly, yearly, and longer cycles. They understood environmental variation, both how to take advantage of it and how to protect against it. Survival required a good knowledge of cycles; seasons both fed and killed them. The demise of numerous cultures around the world in the past several hundred years may be due to a loss of local knowledge and skills, caused by the forced learning of outside skills and knowledge.

Teaching to Place: Tlingit Learning Styles

State and national standards of science inquiry and observation can be met using local resources and ecosystems. Major concepts and ideas can be presented using locally relevant examples and activities. "The depth of indigenous knowledge rooted in the long inhabitation of a particular place offers lessons that can benefit everyone, from educator to scientist, as we search for a more satisfying and sustainable way to live on this planet" (Kawagley and Barnhardt 1997). A teacher can bring significance to learning by establishing local relevance. Begin a subject with Native and local knowledge and, without trivializing local knowledge, expand to the broader context of Western explanation and science.

Societies and peoples throughout the world have established local styles of passing on knowledge. Minority groups throughout the United States have lower standard test scores in part because they have been taught to learn differently from the Western basis for education (Kawagley et al.). Often, young students have already developed a way of learning based on home and family. The Native process or community process of learning may differ from the general Western education process. It is important to learn how and where young people learn in a community, to build on that process, and to introduce change from that process as students move to a different type of learning as they grow older.

Tlingit customs may be deep-rooted in a young child. However, not all Tlingit children know the stories and some may feel uncomfortable admitting their lack of cultural knowledge.

Likewise, a young Tlingit may be embarrassed to admit how much of the culture she or he knows if that student has not developed an understanding of the value of this knowledge. Before you begin a Tlingit project, consult with a local Native organization (e.g., Alaska Native Sisterhood/Brotherhood) or elder to identify and address cultural issues. Many Native parents, like many non-Native parents, have entrusted their child's education to the school and are not familiar enough with the system to feel they can or should contribute to the education process.

In the Tlingit world, information was passed from generation to generation. The acquisition of food and shelter materials required a good knowledge of the areas, seasons, and resources. In southeast Alaska, the abundance of natural resources allowed Native groups to divert a fair amount of energy to their societal structures, which were elaborate and included art, history, legend, and protocol.

Tlingit storytelling is an educational process. If you use Tlingit storytelling or Tlingit stories, check your sources and acknowledge them even if the story is in the public domain. Explain where, when, and how you received the information and permission to share it. Try to include appropriate clan members, parents, and elders who understand the oral tradition process. Respect different interpretations of stories if you hear any.

Tlingit history is recorded orally: movement of clans, important events, and lessons and values are taught through stories. Anthropologists and ethnographers categorized this important information as "legends" and "myths," effectively reducing the value of this history and knowledge. European disease brought to Alaska in the 1800s killed up to 90 percent of the residents of many villages, and along with them the history of the clan or community. There are, however, still a multitude of elders who are culture bearers and historians, and many wait patiently for someone to show some interest in their stories.

Elders Do Not Preserve Culture—They Live It

Elders in the Classroom

by Roby Littlefield

All students can benefit from inter-generational contacts. In Alaska Native cultures, grandparents were held in high regard as they contributed to the community by passing on knowledge and skills. Children learned by listening to and watching elders and often didn't realize they were in training. Bringing grandparents in to share personal knowledge when studying subjects like nutrition, customs, plants, biology, and history can benefit the entire class.

To get started, first look to your class members. Send home a note or survey expressing your desire to include parents, grandparents, and elders in your lessons. Get referrals for possible speakers from organizations that work with Natives and/or the elderly.

The way to ask Native American elders for help is different from Western customs. Initial and subsequent contact should be subtle. Visit with them, allowing time for the conversation to wander. *Allow for extended pauses*, giving them time to think and decide. If their hearing is poor, sit on the side of their better ear and make sure your lips can be seen. Direct eye contact should be limited. Standing or sitting at an angle can increase an elder's comfort level. Keep your questions basic and specific.

Begin the request by telling a little about your class and how the elder could help. If you are not sure if the elder is interested, hint strongly that you would like to have their help and ask if she or he knows of someone who might be willing to participate. Custom teaches that it is rude to give someone a frank "no" to a request for help, so you need to recognize that a noncommittal response might mean "no," or it might mean that the request is being considered. If at some point the elder changes the subject more than once while you are explaining your request, you should be aware that she or he might be trying to say "no." Don't force a response; if it is clearly not a "yes," let it go, or suggest they can contact you after they've thought about it.

It is important to ask *before a meeting* for permission to make audio or video recordings. Don't show up with the equipment; you may force consent and cause bad feelings. Permission to listen to or tape a story or lecture does not give you any right to rebroadcast or write the story with you as author.

If an elder has agreed to participate in a classroom, suggest an activity or topic outline so they know what you are expecting. Provide them with optional dates and the logistics. It is helpful to explain the routine, consequences for students' misbehavior, and possible options if problems come up during the lesson. It is your responsibility to ensure discipline is maintained. Be aware, however, that elders generally do not support strict discipline in a public setting. Discuss how to make a smooth transition to help the elder leave the class. Agree on some visual signals and ground rules.

When the elder arrives, properly introduce her or him so the elder understands your respect for them. The teacher should be alert for visual cues from the elder during the visit and be prepared to give unspoken signals back. The teacher should stay in the room.

Elders' Concerns and Expectations:

- How can I find the room? (transportation, personal guide)
- Will I be respected and appreciated by the students?
- Will I be able to hear the students' questions? (background and noise level)
- Can I speak within the attention span and understanding of the age I am speaking to?

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Give the elder a chance to use traditional discipline. Be prepared to move a child to sit by an adult who can role model how to listen respectfully. If you have problems with students degrading or ignoring an elder, have a teacher's aide or adult Native quietly intervene.

Most traditional stories are like a round, crocheted pot holder. The story teller goes round and round the subject until it all comes together and finally comes to the lesson or point. Be patient; allow the elders to share their culture in their own way. Your students are learning how to listen. Students should refrain from interrupting to ask questions. There will be a proper time to ask questions.

As a thank-you, elders usually appreciate student and teacher letters, pictures, and story booklets, which are treasured and shown to friends and relatives. This may also encourage other elders to participate in classroom projects.

Sometimes you will find a resource person who is available for a wide variety of subjects and projects. If you use an elder more than once, the school should provide some type of stipend in appreciation of the energy and knowledge the elder is contributing. Be careful not to burn out your elders. Whenever you make a request, be sure the elder understands she is not obligated.

Keep your lessons flexible in case the elder can't come at the last minute. Once an elder has agreed on a time to come into your classroom, avoid changing or postponing the visit.

Chapter 2
Dis: The Moon in Tlingit Culture

Introduction

In this introductory unit, students will experience Tlingit history and knowledge, a knowledge system that developed over a span of at least 8,000 years (Matson and Coupland 1995). Students will listen to a traditional story about the moon as it relates to the world. They will be introduced to Tlingit cultural symbolism by making moon masks. In addition, they will apply scientific inquiry and observation and draw conclusions from their observations.

This chapter includes three lessons: (1) Tlingit Myth Box of Daylight, (2) Observing the Moon, and (3) Measuring Time. At least two activities accompany each lesson plan.

As a teacher you must have some familiarity with Tlingit culture. There are several references listed at the end of this book. There are also several excellent curriculum materials that provide background information and activity ideas on the moon.

Students will:

- Explore Tlingit ways of knowing through art and stories
- Make a Tlingit style moon mask
- Predict moon phases
- Observe changes in the moon
- Understand the moon cycle

Standards

This unit covers Native, state, and federal standards. Students will experience a sense of place when they listen to the *Box of Daylight* video and understand the Tlingit beliefs in how light was brought to the world.

Cultural curriculum standards addressed include (Alaska Native Knowledge Network 1998):

A.4: Respect knowledge from different cultural traditions

C.1: Utilize local language

C.5: Use cultural knowledge and state standards

State science standards addressed in this chapter are (Alaska Department of Education 1996):

B.1: Inquiry, observation, and recording standards are employed when students observe the moon for a 2-month period.

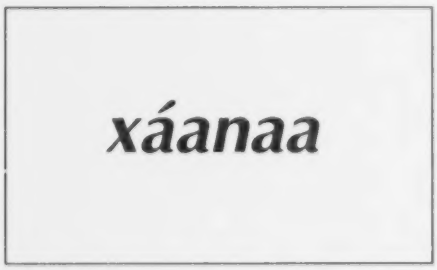
A.4: Understand observable natural events such as … moon phases….

Tlingit Words

English	Tlingit
the moon cycle	disi
moon	dis
day	yakyee
evening	xáanaa
night	taat
day break	keex'é

- It would be best to invite a Tlingit speaker in to pronounce the words at the beginning of the unit.
- You might instead have the words recorded by a Tlingit speaker so you can play them for your students.
- You might also practice the words yourself and then share with the students.
- Make word cards, breaking words into syllables with each syllable a different color.
- Use each word as a password for a day, which must be pronounced before a student can leave the room for recess, etc.

Word Card Illustration:



Lesson 1: Box of Daylight

Overview

The lesson begins with the viewing of the *Box of Daylight* video, followed by a discussion of the story. In this lesson, students are introduced to the Tlingit creation story of the sky. The Tlingit world is defined by the cosmos, the land, and the ocean. In the Tlingit world:

- The cosmos had a beginning; it is precious and valuable.
- Day and night is a pattern.
- The moon represents power, light, and motion.

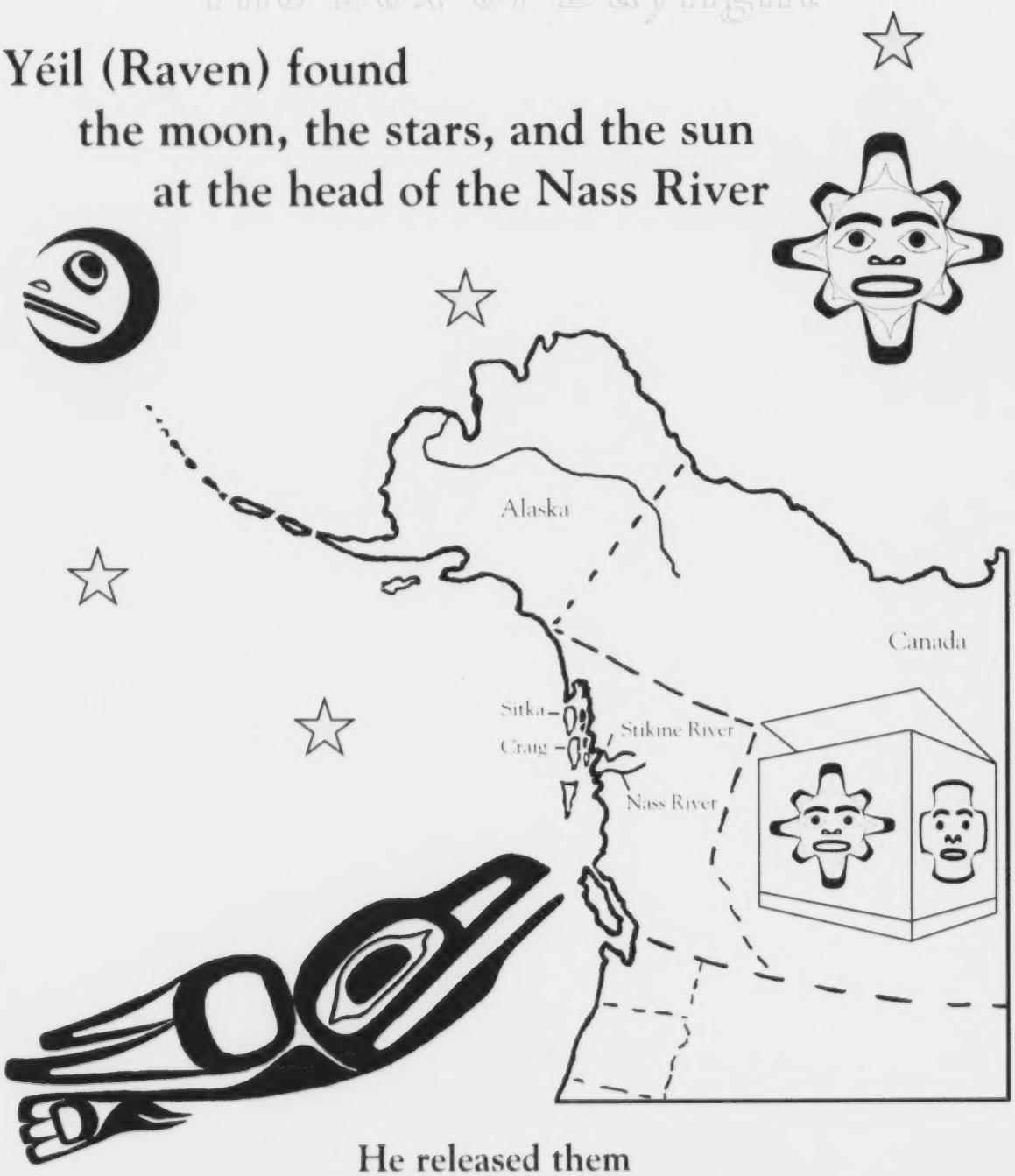
This video provides the basis for demonstrating place—an important cultural standard for the young child. Show the video of the Tlingit story *Box of Daylight* (8.5 minutes). If possible, have an elder come in to tell the story, and if the elder is willing, allow the students to ask the elder the importance of the story to Tlingit. If you do not have the assistance of a Tlingit storyteller, read the story and engage the students in a discussion of the story. The story is available in ethnographic work (Swanton 1909) or in contemporary children's books (McDermott 1993; Pelton and DiGennaro 1992).

Compare this legend to other Native legends on the creation of the cosmos: Boas 1916, pp. 60–64; Lopez 1977, pp. 15–17; Yupik Lore 1981, pp. 179–181.

Materials and Equipment

- VCR and TV
- *Box of Daylight* video (Sealaska Heritage Foundation)
- Written copies of the myth
- A map of southeast Alaska and western Canada (to see the Nass River)
- Examples of a moon mask, or the moon represented in Tlingit regalia

Yéil (Raven) found
the moon, the stars, and the sun
at the head of the Nass River



He released them
so the world and the people
would benefit from their light.

What Did the Student Learn from the Story?

Hand out the Box of Daylight illustration for coloring, and begin discussion.

Discussion Questions

- Why did Raven want the box of daylight? (*So he could see how beautiful he was, to see the beauty of the world.*)
- Why did the chief want to own the box of daylight? (*So he could be powerful.*)
- How did Raven trick the chief? (*He turned himself into a hemlock/spruce needle, and the chief's daughter accidentally swallowed Raven while drinking a glass of water.*)
- What was more important: (1) for the chief to keep the box of daylight or (*2) for the people to have the light for the world?*
- Did the chief come to understand the value of letting the sun, moon, and stars out? (*Yes. He could feel the warmth and see the beauty.*)
- Where is the Nass River? (*You can find it near the U.S.-Canada border, south of Ketchikan and north of Prince Rupert.*)
- Where are the headwaters of the Nass River? (*In British Columbia, Canada.*)

Moon Mask Making

In this activity, students respond to the *Box of Daylight* video by making their own moon masks. There are two types of masks that can be made: flat, two-dimensional or textured, three-dimensional masks. Which type you make will depend on the abilities and interests of your students. The flat mask is easy to make and requires the least amount of time. The three-dimensional mask may take several sessions to complete as there are several stages at which drying time is needed.

It will help if the teacher has a display of a variety of Tlingit masks and different treatments of the moon by Tlingit artists. Check with local Native organizations. Examples may be found in museums, in calendars, on notecards, in books, etc. In addition, there are several examples included in this section. Discuss the purpose and use of the masks: they were used in ceremonial dances and storytelling. Through the use of masks the audience has a better feel for the legend.

Materials and Equipment

- Art supplies: heavy-duty round paper plates; newspapers or papier-maché torn into strips; acrylic paints in a variety of colors; picture wire; fasteners; an assortment of adornments such as feathers, beads, sequins
- Copies of Northwest Coast Sun and Moon Mask examples
- Copies of Northwest Facial Feature Design Elements

Procedures

- Set up materials at work stations.
- Demonstrate on a teacher's mask so students can watch.
- Give hints for success such as controlling wetness and keeping work area organized.

Three-Dimensional Masks

Basic Construction

Use heavy-duty paper plates for the main structure of the face. Apply papier-maché or newspaper strips to create dimension in the facial features such as cheeks, lips, or eyes. When students have completed this step, set the masks out to dry (this will take several days). Take care that the masks do not warp. Clean up work area.

Fix-Up

In this second stage, specific areas are worked on by adding or scraping off papier-maché. Students finish this stage by applying a final layer of papier-maché over the whole mask, which will

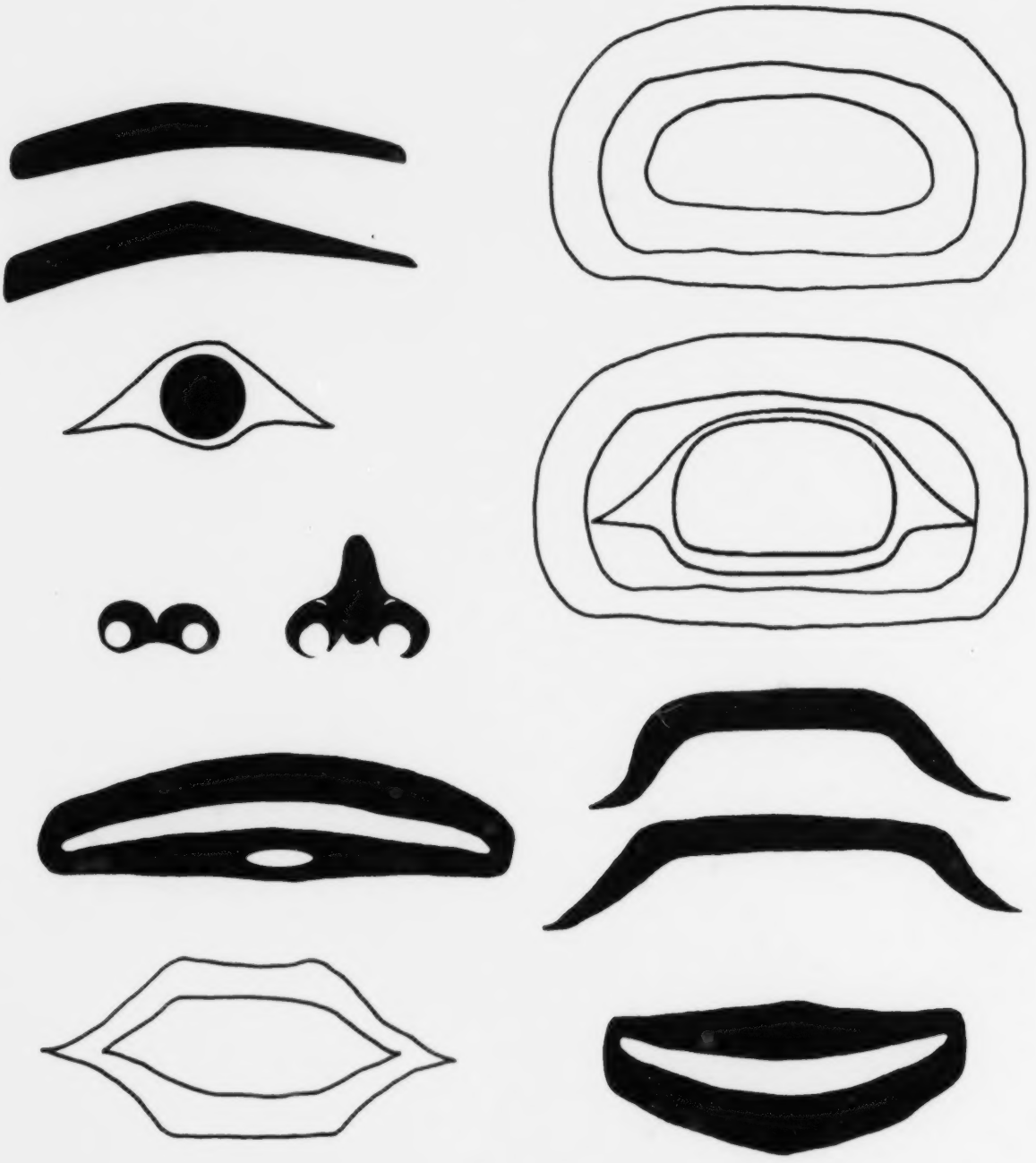
add strength and a smooth surface texture. This is the layer that will be painted. Set to dry.

Finish-Up

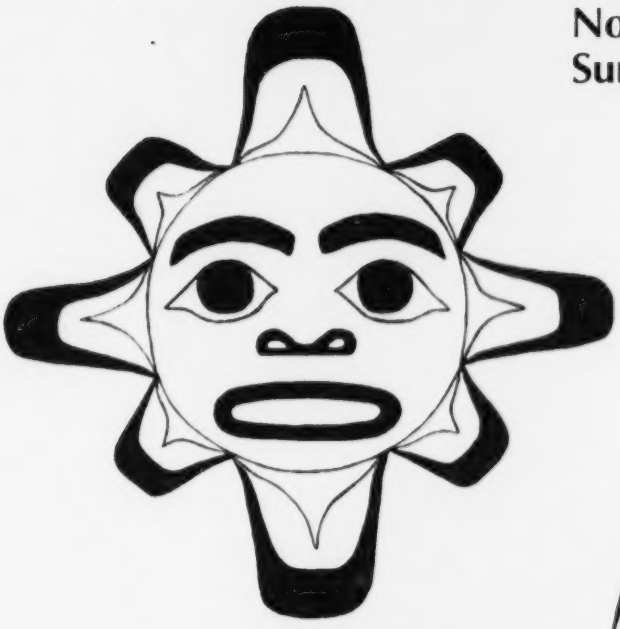
Set up a work table with acrylic paints and embellishments such as fake hair, sequins, beads, buttons, wire or string, colored papers, etc. that students may want to add to their mask.

- Start with a coat of white paint to seal the papier-maché surface, let dry.
- Using the Northwest Facial Feature Design Elements illustrations, have students draw in eyes, eyebrows, lips, etc.
- Paint the face and facial features.
- Use a variety of embellishments to finish the mask.
- Accept all inventions and creative solutions.
- Put brass tacks and wire or string on back of masks to hang on the wall or for use as a face mask.

Northwest Facial Feature Design Elements



Northwest Coast
Sun and Moon Masks

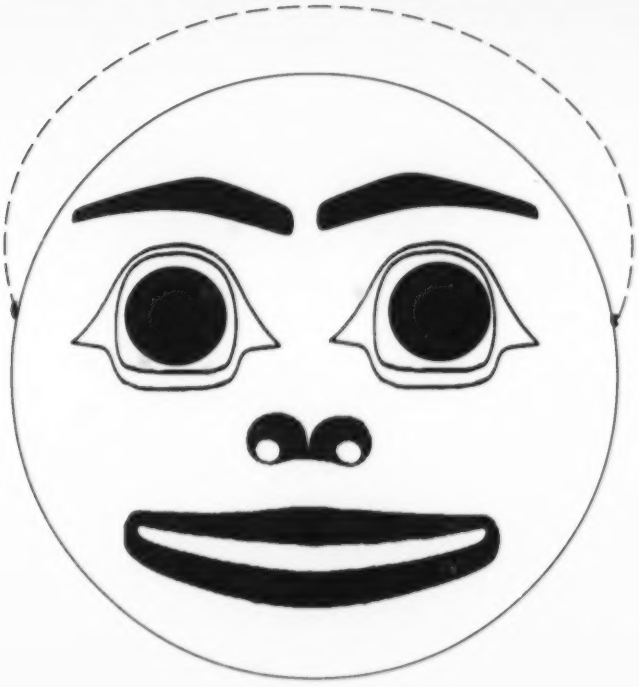


Sun Mask

Quarter Moon Mask

Full Moon Mask

Flat Face Masks



Basic construction

Refer to the Northwest Coast Sun and Moon Masks and Northwest Facial Feature Design Elements illustrations. Have students use a pencil and draw a moon or sun mask design on the back of the plate. The face should include: eyebrows, eyes, nose, and mouth.

Fix-Up

They may use crayon, magic markers, paints, or whatever to give color to the facial features and the background mask. You may choose to stick to traditional colors (black, red, and white) or allow for a broad range of colors to be used.

Finish-Up

Once the design is finalized, students can cut out eyes and mouths so they can use the masks. String can be measured and attached to the sides of the mask to make it usable by the student or to be hung on the classroom walls.

Lesson 2: Observing the Moon

This lesson is divided into three activities: (1) inquiring into the shape and changes of the moon, (2) observing and reporting on moon observations, and (3) making a moon myth. Students use their knowledge to predict how the moon changes. They then observe and record these changes over 2 months and draw conclusions on the changes in the moon's shape over time. They record this information by making a moon flip book. Finally they use this information to create a moon myth that incorporates their knowledge of the moon cycle.

Yées Dís: New Moon

This activity focuses on the Alaska science standard B1, which encourages observation, and introduces cycles of the moon. Begin this activity around the time of a new or full moon.

This activity allows your students to express what they know about the moon. It will lead to making observations that the moon goes through a specific sequence of phases. The focus is to start each student thinking about how the visual appearance of the moon changes.

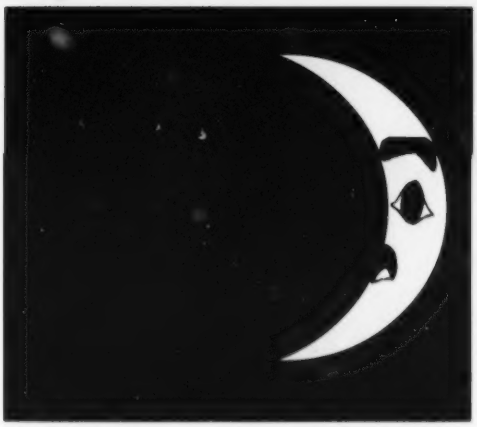
Materials

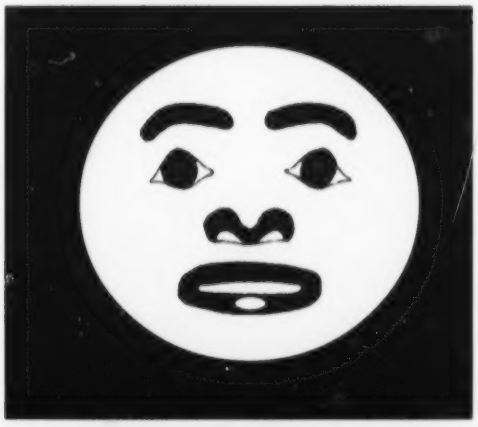
- Student copies of Yées Dís sheets; paper, scissors, and tape

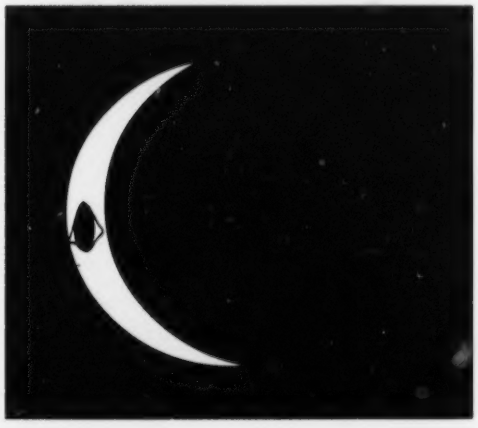
Activity

- Make copies of the Yées Dís sheets; cut up the sheets, creating six cards per set; shuffle each set so the cards are out of sequence.
- Begin by having students draw a picture of what the moon looks like. Have the students compare their pictures and display in classroom.
- Have students discuss why their pictures vary. Do not judge the appropriateness of each drawing.
- After the discussion, hand out Yées Dís card sets for every one to two students. Tell them these represent the moon over a 1-month period. Have them tape them on a piece of paper in the most appropriate order. Allow 5 to 10 minutes for them to work with the illustrations.
- Ask students to explain their reasoning for choosing the sequence they used, and encourage discussion on whether one sequence is more appropriate than another.
- Display for future reference.

Yées Dís: New Moon







Disi: the Moon Cycle

Overview

This activity will span at least 2 months to observe phases of the moon and the predictable change in its shape. Start the lesson around the time of a full moon. The moon's cycle lasts 29.5 days. This is a good activity for the winter, when it is dark during the beginning of the school day. Schedule your observations for the same time each day.

Objective

The student will come to understand that the moon changes in shape in a predictable pattern and cycle. Students will:

- Locate and observe the moon during the day
- Make observations to predict where the moon will be and what it will look like
- Draw a conclusion on the cycle of the moon

Materials

- 8.5 x 14 paper (60 sheets)
- Clip board
- Marker
- Copy master for "How the Moon Changes" flip booklet
- Stapler
- Scissors or cutting board

Activity

- In advance, go outside and locate the moon, then find a place where the students can see the moon without interference from trees or buildings. Bring students to the same area and have them generally look in the same direction.
- Sketch the horizon from the area where the students will view the moon, for a standard sheet that can be reproduced. Include trees, mountains, ocean, houses, etc., which will serve as orientation points for the observation.
- Make 60 copies of this sketch so you can record the moon (its place in the sky and its shape) each day that you go out with your students.
- Each morning, go out to this location with the students and have a different student record on a sheet of paper the moon's location and shape. Have the student date each sheet as it is completed and hang or tape it up in the classroom in chronological order.

- Before the end of each day, have students predict the shape and location of the moon for the next day.
- Predictions and observations should be compared.
- Use a calendar, tide book, or the Internet to find the shape of the moon on days when an observation cannot be made.
- After 1 month, discuss student observations and develop a "testable hypothesis," e.g., *We predict the moon goes through one complete cycle every 29–30 days.* Place the "hypothesis" on the board.
- At the beginning of month two, have students begin and complete the "Moon Flip Booklet" (see following instructions and master copy sheet).
- During the second month, send out only one or two students each day or have students arrive with their moon observations from their walk/ride to school.
- Review the changes in the shape of the moon as well as where the moon is, relative to the horizon. Through analysis of their data, students should come to understand that the shape of the moon changes over time in a predictable pattern. The moon cycle lasts for a specific amount of time: 29.5 days. The moon's place in the sky also changes.

Make a Moon Flip Book

- Copy the master booklet onto both sides of paper.
- Make four 2-sided copies for each student.
- Either the teacher or the students will cut each sheet in half along the dotted line.
- Cut enough construction paper in half to provide a cover for each booklet, and distribute to students.
- Have the students stack the eight halves on top of each other with the booklet cover on the bottom.
- Staple along the fold line.
- Fold the papers to make the booklet.
- Students should end up with a booklet with 32 pages for drawing the moon.
- Have students draw a Native moon mask design on the booklet cover.
- At the same time each day, take students out early in the morning to the same spot to observe the moon's place in the sky and its shape.

How the Moon Changes
Date: _____

fold line

How the Moon Changes
Date: _____

cut line

How the Moon Changes
Date: _____

fold line

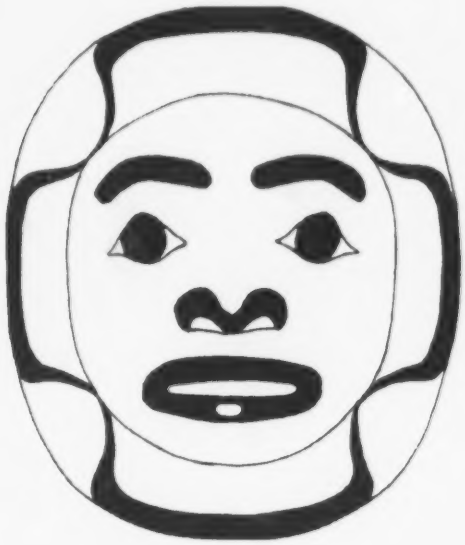
How the Moon Changes
Date: _____

- After the students come back in, have them draw what the moon looked like in their booklets, dating each observation.
- They should duplicate the shape of the moon as closely as possible.

Moon Myth

After students have completed their moon observations and come to understand the predictability of the moon cycle, ask them to create a myth to accompany their moon mask.

Students can work individually or in groups. They can be very creative, using animals or people with super powers or traditional Native characters. The challenge is for students to describe and explain the phenomenon of the moon cycle and its impact on people or animals. Students may want to review the video *Box of Daylight* again to help them with their creation of a moon myth.



Lesson 3: Measuring Time

Overview

In this activity, students review several calendars as ways of measuring time. They compare the Tlingit calendar with calendars used today. Students are introduced to the Tlingit practice of naming the months in terms of moons and activities.

The Tlingit annual cycle (calendar) is divided into 12 or 13 periods or cycles termed *dis*, "moons," or *disi*, "moon of" corresponding to lunar months. The names usually indicate seasonal changes in the animal or plant world. Tlingit survival depended on knowing these seasonal and annual changes.

There are variations in the names and the number of moons in Tlingit calendars. There are several sources for information on Tlingit moons/months, some of which are found in the reference section at the end of this book. You may also turn to your local Native elders to find the names of moons and cycles for your region or community.

The Tlingit year or cycle begins at different times. It may begin in the spring when the herring arrive, or later when plants begin greening. Annual cycles generally end sometime in late winter after potlatching. Generally, days and years were not counted by Tlingit. Important events—epidemics, great potlatches, raising house poles, the great flood, or receding glaciers—marked time.

By comparison, the Julian or Gregorian calendar used today is divided into 12 months of 28–31 days. The months are not measured or determined by the moon cycle, although full and new moons are frequently noted on the calendars. The Julian/Gregorian calendar is a standardized system of measuring time used around the world, allowing for accurate communication and record keeping.

Materials and Equipment

- Student copies of the Tlingit calendar and the Tlingit and Haida months
- Standard Julian calendar indicating full and new moons
- A variety of calendars employing different formats

Activity

- Provide each student or student team with a copy of the Tlingit calendar and with a standard calendar.
- First review the Tlingit calendar. Ask students what they noticed. At a minimum, students should report that the

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Tlingit Cycle*

Xaat Dísi
Salmon moon

Sha-ha-yi
Berries ripe on mountain

Dis Yádi
Young (animals) moon

Dís Tlein
Big moon

Kukahaa Dís
Scraping moon

Shanáx Dís
Unborn seals are getting hair

T'aawak Dís
Goose moon

S'eek Dís
Black bear moon

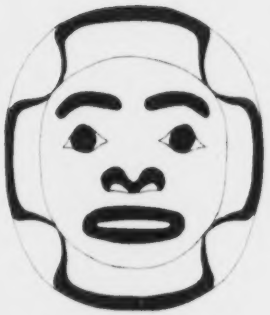
Héentáanáx Kayaan'i Dís
Underwater plants sprout

X'eigaa Kayaaní Dís
Budding moon of plants and shrubs

At gadaxéet yinaa Dís
Month before pregnancy

At gadaxéet Dís
Birth moon

*Based on Kake cycle—may vary for your community



Tlingit and Haida Moons compared to Julian Months

Julian Months*

January—Janus, Roman god with two faces—one looking forward, one back.

February—After the mid-month Roman festival of cleansing.

March—for Mars, the Roman god of war. First month of the Roman year.

April—From the Latin word "spera," meaning "after," or the second month after the first.

May—After Maia, Roman goddess of increase or growing.

June—After Juno, the Roman goddess of marriage.

Haida Moons**

Táan Kungáay
Bear hunting moon

Hlgit'ún Kungáay
Goose moon

Xitgáas Kungáay
Noisy goose moon

Xíit Kungáay
Migratory geese moon

Tahálaa Kungáay
Food-gathering moon

Gáan Kungáay
Berries ripen moon

Tlingit Moons (Kake)***

T'aawak̲ Dís
Goose moon

S'eek Dís
Black bear moon

Héentáanáx̲ Kayaan'i Dís
Underwater plants sprout

X̲'eigaa Kayaaní Dís
Budding moon of plants and shrubs

At gadax̲éet yinaa Dís
Moon before pregnancy

At gadax̲éet Dís
Birth moon

Julian Months	Haida Moons	Tlingit Moons (Kake)
July—After the Roman emperor Julius Caesar.	**Gáangálang Kungáay** Ripe berries	**Xaat Dís** Salmon moon
August—After the Roman emperor Augustus Caesar.	**Chíin Kungáay** Salmon moon	**Sha-ha-yi Dís** Berries ripe on mountain
September—From the Latin word "septem," meaning "7th month, (although it is now the 9th month)	**K'íit'aas Kungáay** Cedar bark for hat and baskets	**Dís Yádi** Young (animals') moon
October—From the Latin "octo," meaning "eight."	**Kálk Kungáay** Ice moon	**Dís Tlein** Big moon
November—From the Latin "nine" for the 9th month.	**Cha'áaw Kungáay** Bears hibernate	**Kukahaa Dís** Scraping moon
December—From the Latin "decem," meaning 10.	**T'a'áaw Kungáay** Snow moon	**Shanáx Dís** Unborn seals are getting hair

*January 1 is when the Romans began their new fiscal year. March 25 was the first day of the new year.

**Cogo 1979

***from Ruth Demmert, Kake

Tlingit calendar does not assign days to each month, but uses the moon as a reference.

- Some Tlingit calendars have 13 months per annual cycle. The end of one annual cycle and the beginning of another are different from the standard calendar and may also be different in areas around southeast Alaska. Tlingit moon names are tied to resource availability.
- Compare the Tlingit calendar to the standard calendar. What are the similarities and what are the differences?
- Ask students how they think calendars evolved. What does the Tlingit calendar reveal about the Tlingit people?
- Ask whether a more numerical or standardized calendar would have been necessary. Could people go back to moon calendars? Do students' families do things centered around the lunar cycle (dig clams, work on boats, etc.)?
- Compare to local and regional cycles (see Nelson 1983 for Athabaskan cycle; Boas 1916 for Tsimshian cycles, etc.).

Summary

Set up a display of completed masks, flip books, and myths. Have students perform their myths using their moon masks. These may be shared at a family or community event.

Chapter 3
People of the Tide

Reflecting the tie between people and the sea, Cyrus E. Peck Sr. explains that the word *Tlingit*, commonly defined as "the people," really means "the Tides People" because *Tlin* (pronounced *lein*) means *tides* in Tlingit and *git* is Tsimshian for *human being* (Peck 1975).

Tlin (lein) means *tides* in Tlingit and *git* is Tsimshian for *human being* [Tlin (tides) git (people)].

Introduction

Humans have been observing the tide for a long time. Ancient mariners thought the tide was caused by the breathing of the earth monster. Tlingit believe the tide was created by Raven to provide food for humans who live along the coast.

The Tlingit people have depended on the ocean and its tides for thousands of years to provide food and a means of transportation. There were many permanent village sites as well as spring and summer campsites in the many islands, sheltered coves, and inlets throughout southeast Alaska. Community members or clans understood the tidal cycle, and clans used this knowledge to move between their winter, summer, and spring sites. Long-term survival of these many villages depended on Tlingit knowledge of the sea and its resources.

In this chapter, students:

- Listen to a traditional story about the creation of the tides, followed by a review of the biology of the myth
- Make observations of the tides over time
- Make connections to the moon
- Recognize patterns of change

Standards

Several cultural standards are addressed (Alaska Native Knowledge Network 1998), including:

A.4: Respects and validates knowledge that has been derived from a variety of cultural traditions

C.1: Utilizes the local language

C.2: Recognizes the depth of knowledge that is associated with the long inhabitation of a particular place

C.4: Views all community members as potential teachers and all events in the community as potential learning opportunities

C.5: Uses local cultural knowledge to acquire the conventional curriculum content as outlined in state standards

State standards addressed include (Alaska Department of Education 1996):

A.4: Understand observable natural events such as tides … and moon phases.

A.15: Use science to understand and describe the local environment.

B.1: Use scientific processes—observe, measure, interpret, infer, communicate, and predict.

C.4: Understand that some personal and societal beliefs accept nonscientific methods for validating knowledge.

Tlingit Words

English	Tlingit
strong tide	haat
low tide	lein
high tide	kées'
it is a big tide	kées' tlein áyá
it is low water	yan oowaláa
minus tide	léin tlein áyá
the tide is falling	yei naléin
it is approaching high tide	déi yankaa déi yaanadéin

Lesson 1: Raven Creates the Tides

Overview

In this lesson, students are exposed to the creation of the tides in the Tlingit world. The creation of the tides is essential to the existence of Tlingit, Haida, and Tsimshian people, who depend on intertidal resources for food, culture, and livelihood.

The full text of this myth can be found in Swanton (1909). "Raven Who Went Down Along the Bull Kelp" has been greatly condensed and simplified; the teacher should read the full myth to understand a part of Tlingit history.

Materials and Equipment

- Copies of Géesh Daax woogoodi Yéil (Raven Who Went Down Along the Bull Kelp)
- Crayons, coloring pencils, etc.

Activity

If possible, have an elder come in and tell the history of the creation of the tides. If this is not possible, read the myth to your students, or have students take turns reading the myth aloud (long or short version, depending on your students' abilities). You may wish to compare this to the Tsimshian legend, "Origin of the Tides."

Origins of Tides

(Tsimshian Legend)

Again Txamsem took his raven blanket and flew over the ocean with the firebrand in his hands. He arrived at the mainland and came to another house which belonged to a very old woman, who held the tide-line in her hand. At that time the tide was always high, and did not turn for several days, until the new moon came, and all the people were anxious for clams and other sea food.

Giant entered and found the old woman holding the tide-line in her hand. He sat down and said, "Oh, I have had all of the clams I need!" The old woman said "How is that possible! How can that be! What are you talking about, Giant?" "Yes, I have had clams enough."

The old woman said, "No this is not true." Giant pushed her out so that she fell back, and he threw dust into her eyes. Then she let the tide-line go, so that the tide ran out very low, and all of the clams and shellfish were on the beach.

So Giant carried up as much as he could. The tide was still low when he reentered. The old woman said, "Giant, come and heal my eyes! I am blind from the dust." Giant said, "Will you promise to slacken the tide-line twice a day?" She agreed, and Giant cured her eyes. Therefore the tide turns twice every day, going up and down. (From Boas 1916.)

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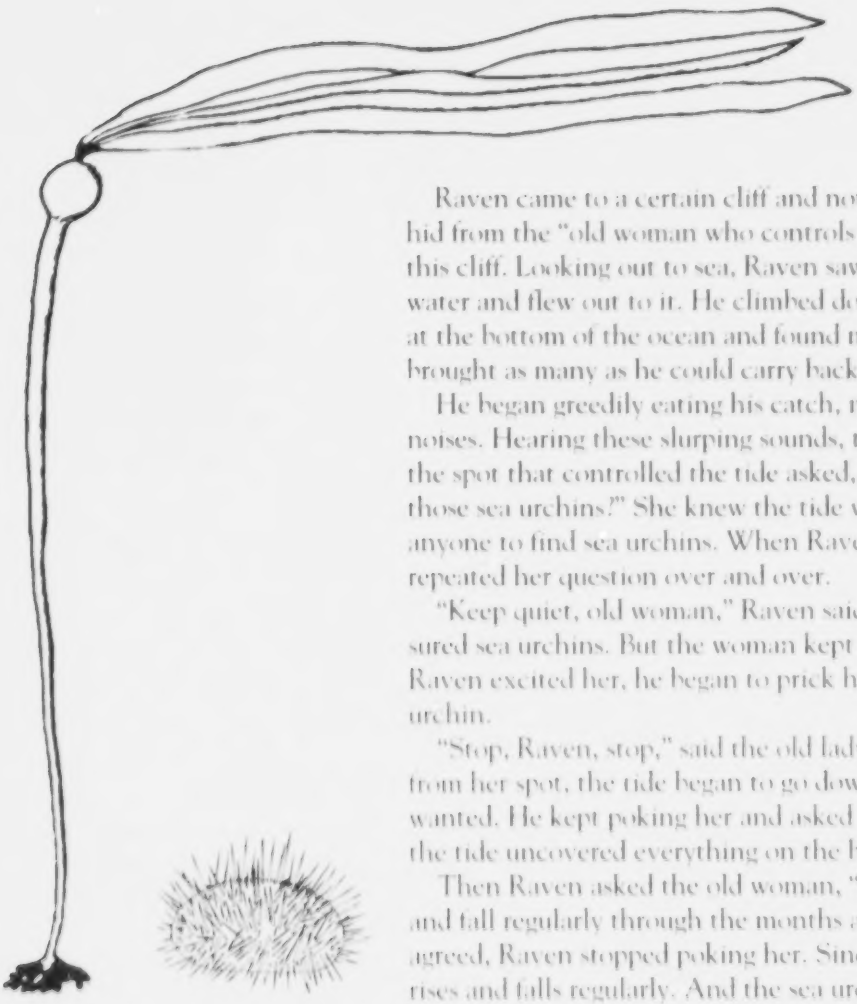
Géesh Daax woogoodi Yéil

(Raven Who Went Down Along the Bull Kelp)



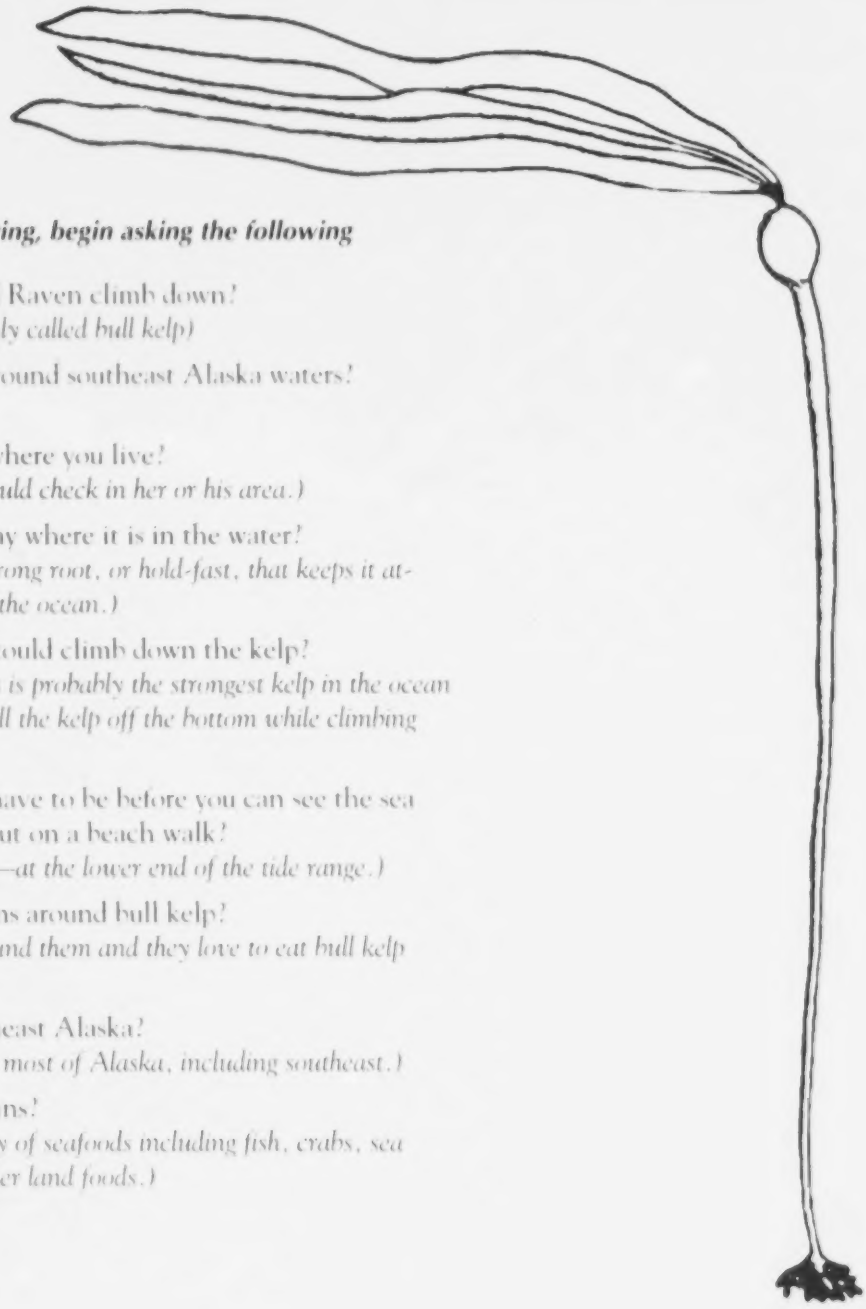
Raven came to a certain cliff and noticed an open door. He hid from the "old woman who controls the tide" who lives in this cliff. Looking out to sea, Raven saw some bull kelp in the water and flew out to it. He climbed down the kelp to the roots at the bottom of the ocean and found many sea urchins. He brought as many as he could carry back up with him.

He began greedily eating his catch, making loud slurping noises. Hearing these slurping sounds, the woman who sat on the spot that controlled the tide asked, "Where did you get those sea urchins?" She knew the tide was not low enough for anyone to find sea urchins. When Raven ignored her, she repeated her question over and over.

"Keep quiet, old woman," Raven said, still eating his treasured sea urchins. But the woman kept up her questioning. After Raven excited her, he began to prick her with the spines of the urchin.

"Stop, Raven, stop," said the old lady. As she began to move from her spot, the tide began to go down. This is what Raven wanted. He kept poking her and asked mink to tell him when the tide uncovered everything on the beach.

Then Raven asked the old woman, "Will you let the tide rise and fall regularly through the months and years?" When she agreed, Raven stopped poking her. Since that time, the tide rises and falls regularly. And the sea urchin has become the mink's food. This is why old ladies have brown spots on their behinds.



While students are coloring, begin asking the following questions:

1. What kind of kelp did Raven climb down?
   (Nereocystis—commonly called bull kelp)
2. Does this kelp grow around southeast Alaska waters?
   (Yes, in many areas.)
3. Does it grow around where you live?
   (Probably—teacher should check in her or his area.)
4. How does this kelp stay where it is in the water?
   (This kelp has a very strong root, or hold-fast, that keeps it attached to the bottom of the ocean.)
5. Do you think Raven could climb down the kelp?
   (Yes, it is possible—this is probably the strongest kelp in the ocean and Raven wouldn't pull the kelp off the bottom while climbing down.)
6. How low does a tide have to be before you can see the sea urchin when you go out on a beach walk?
   (A minus 2.5 or more—at the lower end of the tide range.)
7. Do you find sea urchins around bull kelp?
   (Yes, they grow all around them and they love to eat bull kelp roots.)
8. Do mink live in southeast Alaska?
   (Yes—they live around most of Alaska, including southeast.)
9. Do mink eat sea urchins?
   (Yes—they eat a variety of seafoods including fish, crabs, sea urchins, clams, and other land foods.)

Lesson 2: Observing the Tides

Overview

When Raven tricked the old lady and made the tide, he said to the people:

"When the tide is out you get your food from the beach; when the tide is in you get your food from the woods."

That was when Raven got his name—from the old lady. And so Tlingit people get much of their food from the intertidal area and from the ocean. To do this, Tlingit must understand the local environment, including the tides and their relation to the moon, ocean water movement, biology, and ecology. In this lesson, students learn about tide levels over time. Begin this unit during spring, when the tidal variation is greater and there are good low tides in the morning.

This lesson includes four activities, which should be carried out in consecutive sequence:

- Measuring the Tides
- Using Your Data to Estimate the Tide
- Predicting the Tide
- Reading the Tide

Activity 1: Measuring the Tides

Overview

This activity involves several steps over several days. It starts with a beach walk, which should be taken during a low tide, followed by the creation of a classroom mural of the beach. This is followed by tidal observations and data recording.

In preparing for this activity, ask students what they noticed about the tide on their way to school that morning. How can they tell whether the tide is *ebbing* (going out) or *flooding* (coming in)? Ask students to share what they know about the tides.

Students should create data books to record about a month's worth of tidal observations. Or the record books can look similar to the moon flip books.

Materials and Equipment

- Large markers, crayons, etc.
- Large paper to create classroom intertidal mural
- 20- to 30-foot rope with 1-foot markings
- Large paper for making a classroom-size graph

- Student graph or construction paper
- Student data books or journals

Day 1:

Begin this activity with a class field trip to a convenient beach, where students will draw a profile of the beach on 8.5 x 11" graph or construction paper. Students should include key landmarks—pilings; beach grass; rock outcroppings with ocean critters such as popweed, barnacles, seaweeds; etc. Also, establish an upper tidal marker for use in the remainder of this activity (where the beach grass starts, etc.).

Day 2:

In the classroom, have students draw a large classroom mural of the same beach, including all landmarks. The mural should have room on one side to record the tide level relative to landmarks (see example). They will also need a chart to record the changes in tide level. Students should keep their original drawings for their own recordings and analysts.

Day 3:

Four recordings of the tide will be taken at 2-hour intervals for several days.

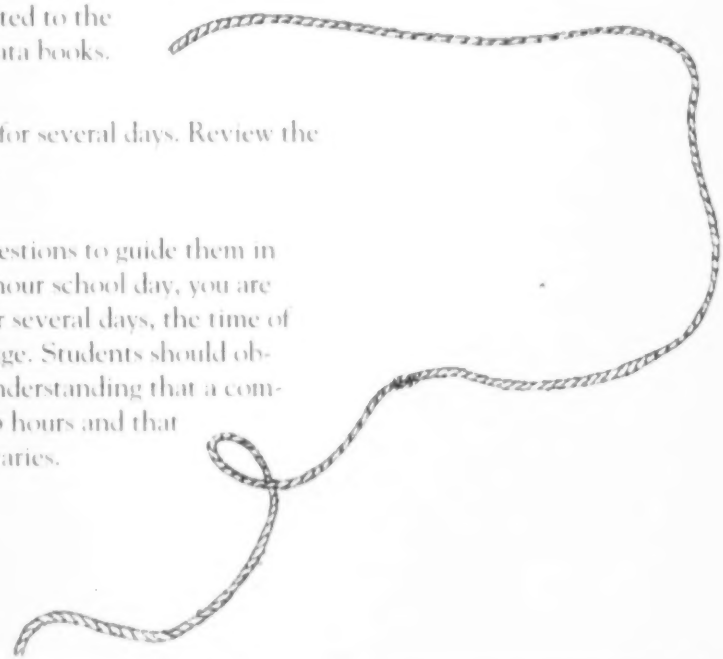
Break the students into four groups. Assign each group a specific time to go to the beach each day and record the tide level. They should measure the distance between the water level and the designated marker and record the data. They should also record the tidal level relative to local landmarks (below barnacles, etc.) and record it on the classroom chart. This information will be reported to the class for students to record in their data books.

Days 4–6:

Continue recording the tide level for several days. Review the observations at the end of each day.

Review

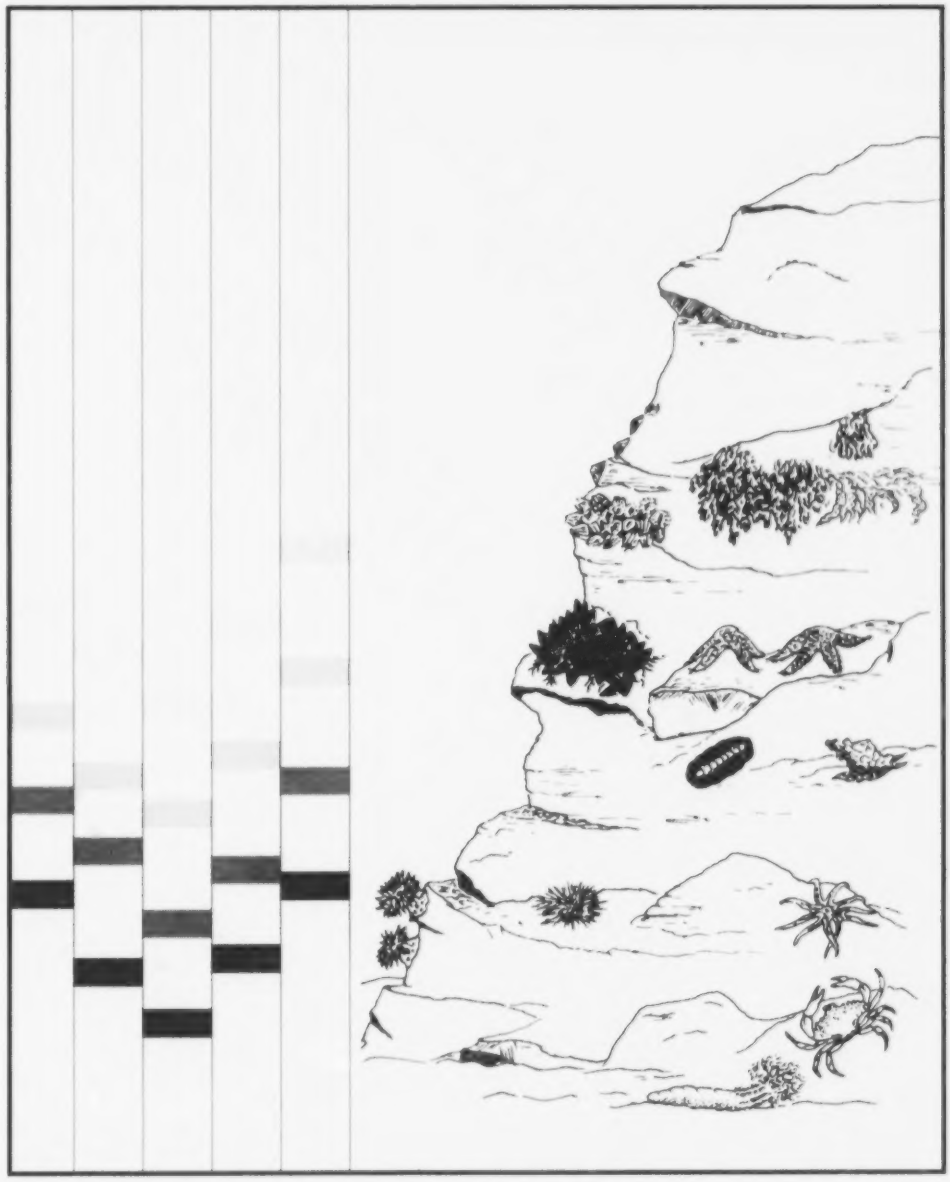
After several days, ask students questions to guide them in interpreting the data. In a typical 6-hour school day, you are likely to observe one tidal shift. Over several days, the time of the highest and lowest tide will change. Students should observe this. Students should end up understanding that a complete ebb or flood cycle takes about 6 hours and that the height of the high and low tide varies.



Example of Recording Tide Levels Relative to Beach Inhabitants

Beach name: Little Bear Bay

Date: 4/1 4/2 4/3 4/4 4/5



Use a different color for each time period a tide level is observed:

e.g.: red: 8:30 yellow: 12:30

blue: 10:30 green: 2:30

Activity 2: Using Your Data to Estimate the Tide

Overview

Students will use the observations collected from the past few days to estimate tide levels.

Materials and Equipment

- Tide tables
- Tide observation data

Activity

Students will estimate the tide levels by comparing their observation data with a local tide table.

- Using a local tide book, determine the times of high and low tides.
- Compare your observations with the tide table and estimate approximate tide levels with your observations (see example).
- Bring in a local who can explain how the tide is gauged using local landmarks (e.g., the boat-cleaning pilings are first exposed at a minus 1.0 tide).
- Use math to estimate tide levels at certain times.
- Estimate the rate of change:
  [1.5 + 11.5 = 13] 13 feet divided into 6 hours = 2.17 feet per hour.

Using Your Data to Estimate the Tide

Date	Time Tide Level Recorded	Landmark Observation	Tide Table Reading	Estimated Tide Level
April 5	8:30 AM	big brown seaweeds are exposed	-1.5 feet	n/a
April 5	10:30 AM	water level just below ribbon seaweed	n/a	3.5 feet
April 5	12:30 PM	water level back up but rockweed still exposed	n/a	7.5 feet
April 5	2:30 PM	water level high, no sealife visible	11.5 feet	n/a

Activity 3: Predicting the Tide

Overview

In this activity, students will apply their knowledge from the past two activities to predict when the tide will be highest and lowest. This will require that students continue to observe the tide for several weeks. They will graph the tidal cycle as part of the analysis and prediction. Teachers need to time this activity so that students will see a shifting low or high tide during the day.

Materials and Equipment

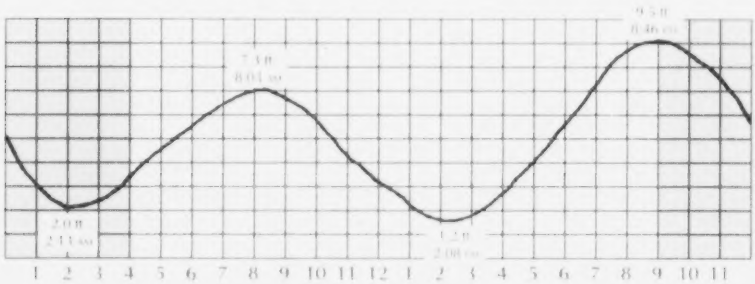
- Chart-size graph paper
- Local tide table book and overhead of same
- Graph paper
- Student data books

Activity

Students should continue tidal observations for 2 weeks. They can observe the tides as part of their daily activities (on the way to or from school, after school, during lunch, etc.). They should continue to use their key landmarks as guides and not use tide books. Identify the time of the last recorded high or low tide and predict when the next tide change will occur. Have students record their predictions. Continue comparing predictions and observations for another week.

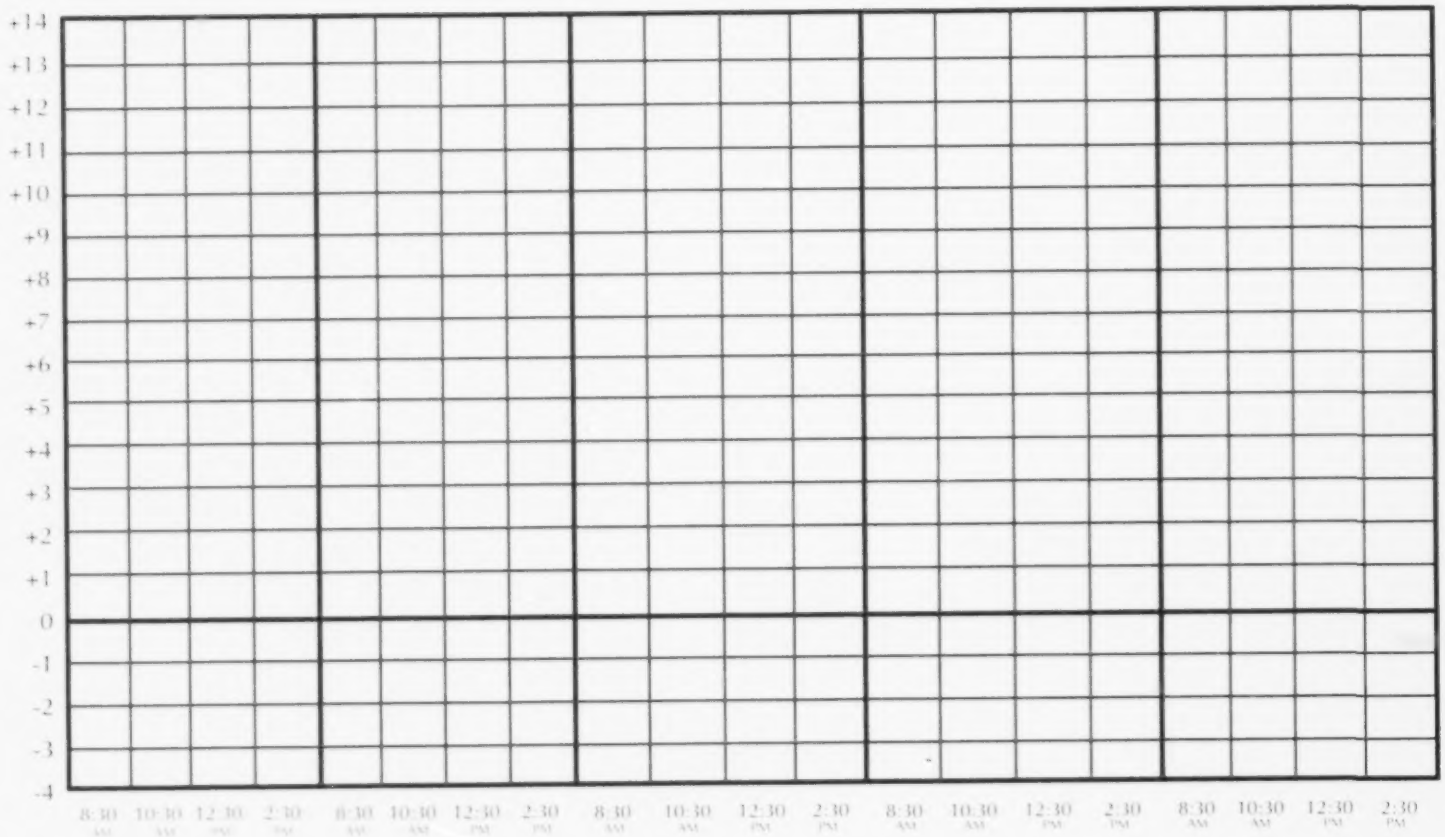
Provide each team with graph paper and a felt pen. Have them graph the whole tidal cycle for a specific day. Each student or team should graph a different day so you have a sequence of tidal cycles for 1–2 weeks. They should see two high tides and two low tides per day.

Have students report on their graph in sequential order. They should notice that the time of the high and low shifts by 30–45 minutes each day. They will see that each tidal change generally takes about 6 hours—although it can take anywhere from $5^1/_4$ to $6^1/_4$ hours.

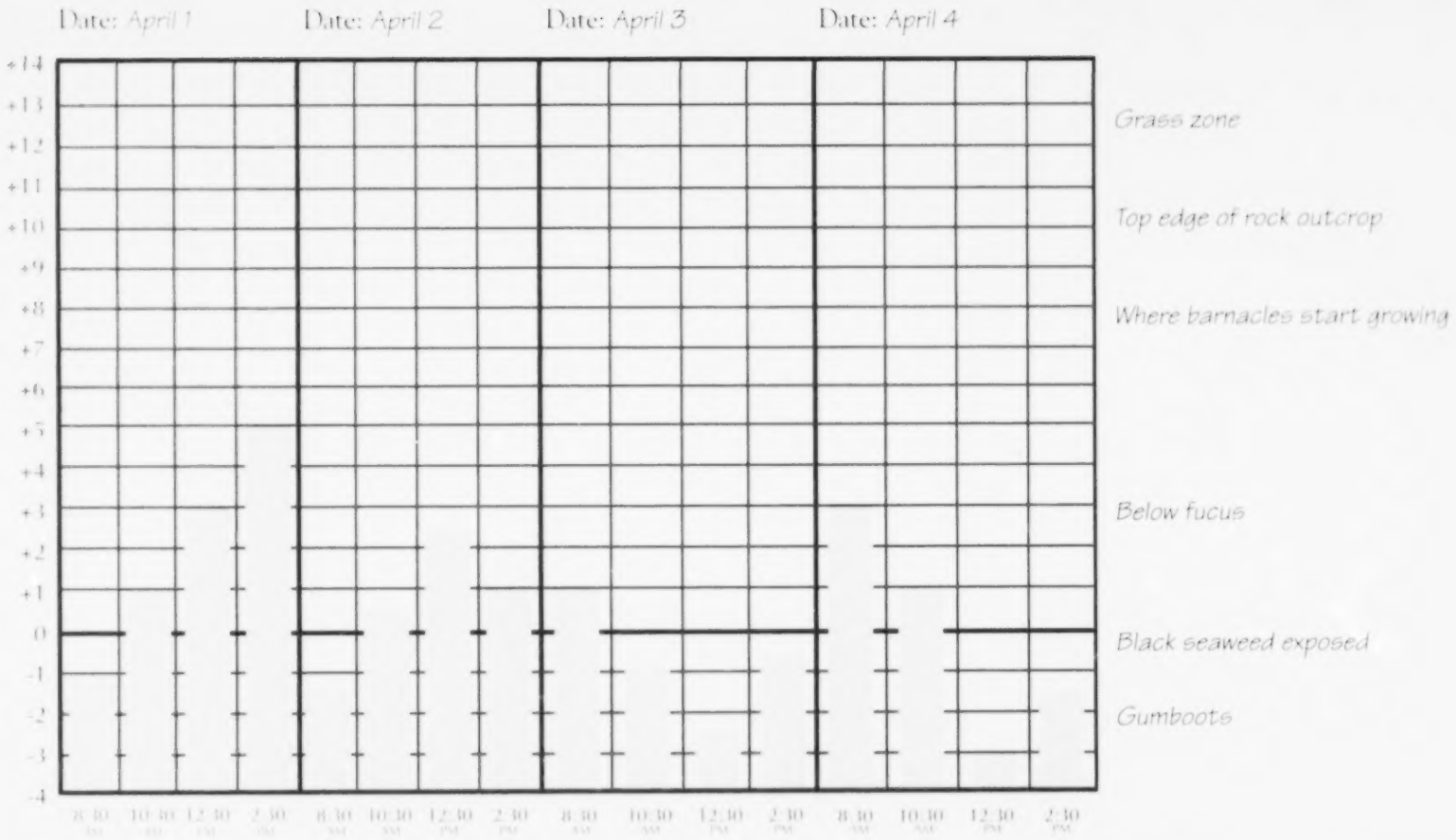


Weekly Tide Levels record chart

Date: Date: Date: Date: Date:



Example of Weekly Tide Levels recorded by students



This example demonstrates how the low tide is: later each day, and lower each day, until the last day when the lower tide begins to rise again.

Activity 4: Reading the Tide

Overview

By now, students should understand the diurnal nature of the tidal cycle. To ensure this, have students interpret the local tide book. This may also be the time when you discuss variations in tidal ranges due to longitude and latitude (e.g., can you use a Sitka tide table for Tenakee?).

Materials and Equipment

- Overhead or enlarged photocopy of page(s) in tide book
- Copy of tide table for the current month
- Copy of tide table for current month for another southeast Alaska town

Activity

Distribute a copy of your local tide table to every student or student team. Using an overhead projector with a copy of a page from the tide book, teach students how to read the tide book.

Ask them questions like:

- On April 1, how high is the highest tide?
- On April 1, how low is the lowest tide?
- What time are the high tides on April 15?
- What time are the low tides on April 22?
- On what day in April is the lowest tide of the month?
- On what day in April is the highest tide of the month?
- Ask the same questions for another southeast Alaska town.

Review Activities 1–4

Students should come to understand the pattern or cycle of the tides. Although both the time of the highs and lows as well as the heights of the highs and lows vary, the tide cycle is regular and predictable.

In reviewing the activities, students should understand that the highest and lowest tides occur during the same tidal cycle. Between these extreme tides, the tides are neither very high nor very low.

Discuss and compare the similarities and differences between local knowledge of the tides and knowledge that can be gleaned from a tide book. How is each perspective helpful and/or important? Tide books can be used to determine the height of the tides. Having local knowledge will aid in knowing how to use the tides for transportation or food gathering.

Using Local Knowledge

- Tell students to plan a seaweed-picking trip to a local island or spot.
- They need as much time as possible to pick at low tide.
- They must consider safety—tidal currents and swells and waves.
- They must plan for time to travel to and from the site.
- They can solicit local knowledge as well as the tide book to identify the best month, day, and time to pick this seaweed.
- They should provide:
  —route information
  —information on how they are accounting for the tide
  —how much time they will need for travel to and from
  —how much time they will have to pick seaweed

Activity 5: Update Murals

Overview

In this field trip, students revisit their beach at a low tide to observe upper beach and intertidal zonation patterns to update their beach profile.

Materials and Equipment

- General field trip gear (boots, raincoat, hat, first-aid kit, etc.)
- Journals

Activity

Go on the field trip to their beach. Have students break into groups and review zonation of marine invertebrates and seaweeds. They should estimate the tide level range for major zonations (e.g., barnacles grow at the 8- to 6-foot tide level) based on knowledge gained from the past four activities. Students should develop a good understanding of zonation.

After returning from the trip, update the mural and/or student beach profiles. Can data from the past four activities be used to better estimate the tide level ranges at which different marine life thrives?

Lesson 3: The Moon and Tide

Overview

In this lesson, compare the phases of the moon with tidal cycle data to see the relationship between the two cycles.

Materials and Equipment

- Tide tables and overhead of page from same
- Moon phase data, or calendar with moon phases

Activity

Have students or teams record the tide highs and lows on every day of a different month on a calendar that has the moon phases on it. Or draft a blank month calendar and have students record both moon and tide cycles. Have students sequentially report on their recordings. Students should see the relationship between the moon cycle and the tide cycle (see the following page).

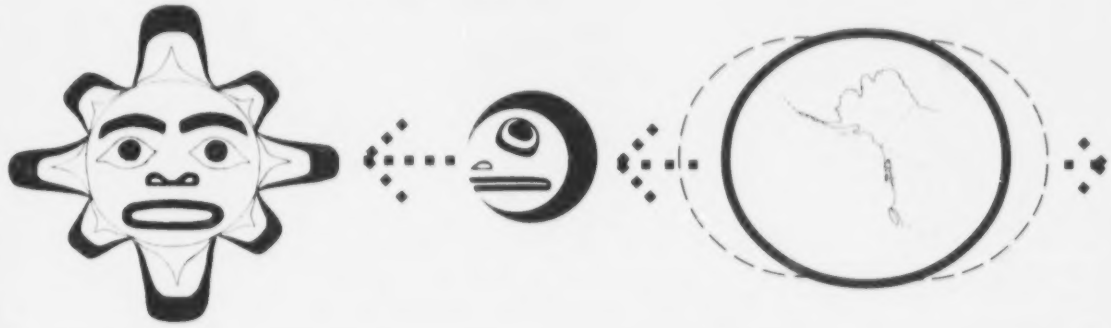
Discuss how Natives and locals use knowledge of the moon and tide relationship to plan activities. For example, they:

- Gather foods such as seaweed, abalone, and shellfish at low tide
- Embark on long travels during neap tides when tidal currents are not as strong
- Know not to go through certain straits during extreme tides, due to strong tidal currents
- Know the weather is often rougher during extreme tides and be more cautious with travel, etc.

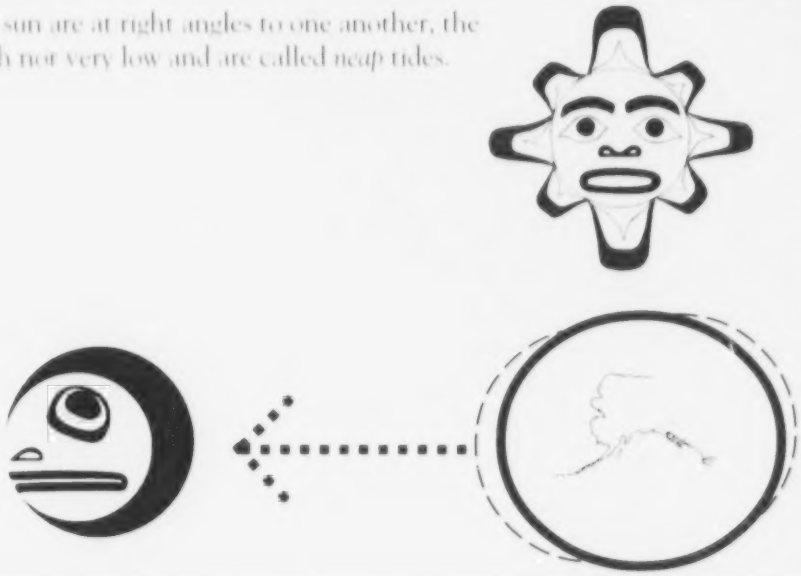
The Moon and Tide Are Related

The tides are caused by the rhythmic variation in the depth of the water at different times of the day. When humans began recording the events, they found that tides were closely related to the movements of the moon. Science confirmed that the movement of the moon and the sun influence the tides. There is a complete tidal cycle of two highs (floods) and two lows (ebbs) approximately every 24 hours 50 minutes. The gravitational pull of the moon causes two bulges of water: one toward itself and one on the opposite side of the earth.

When the earth, moon, and sun line up, there is either a full or a new moon. During these times, the tides are highest and lowest. New moons produce higher water than full moons. Why? Because the sun and moon are pulling in the same direction. These tides are called *spring* tides.



When the moon and the sun are at right angles to one another, the tides are neither very high nor very low and are called *neap* tides.



Chapter 4
Tlingit Cycles: The Moon and Tide

Introduction

This chapter brings the previous chapters together in a final project. The cycle theme is expanded to include the seasons, changing habitats, and food gathering activities of the Tlingit people.

The students will:

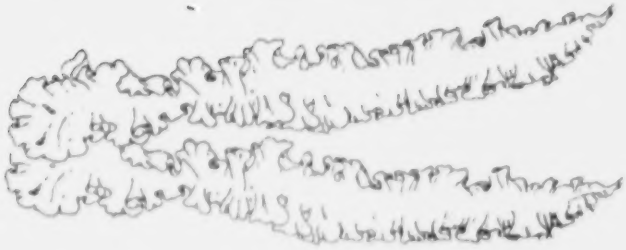
- Develop a calendar
- Receive knowledge from elders on the use of coastal resources
- Monitor and record changes in a specific habitat
- Analyze and summarize beach ecosystem data and observations.

Students will draw connections to how Tlingits and locals use cycles over the year. Cycles are essential features of the natural world. Ecosystem changes such as plant and animal lives, seasons, and the flow of energy and matter through food chains are all in cycles. Students should develop a broader understanding of cycles from their observations of their world.

Historically, Native people depended on plants and animals for their food, clothing, materials for tools, weapons, shelter and so on. They were well attuned to the seasonal variations in animal and plant behavior and abundance. It is through observation and experience that Tlingit people know which marine plants and animals are good to eat, and when, where, and how to gather them.

Over several thousand years, Tlingit people developed a pattern of life based on the seasonal cycles of plant and animal abundance. They moved using the tides and measured time using the moon and changes in animal and plant cycles. They moved to winter village sites or spring and summer hunting and fishing camps based on resource availability. The culture was well structured and allowed for diverse occupations for men and women.

This cycle of life has been forcibly modified by European contact. Hunting and fishing laws, wage labor, Western schooling, and "store bought" food and clothing have altered the Tlingits' thousand-year-old cycle. However, Tlingit people still maintain a traditional life cycle that is vibrant and vital in rural Alaska. The gathering, preservation, and eating of traditional foods remains a part of daily life and many people continue to



depend on wild foods for a considerable proportion of their dietary needs.

The harvesting and use of these natural resources is also necessary to the cultural survival of Tlingit, Haida, and Tsimshian people. As Henry Katasse explains, Native food provides more than nutrients:

> *Our bodies are accustomed to the various foods that we eat. Our body craves it, we have many things that nature provided by season. There are seasons for vegetables, greens, seasons for fat; seasons for shellfish, and seasons for many things when it's time for us to eat and enjoy them. All we have to do is accumulate them and put them away for the winter.... We never bothered anything out of season* (Newton and Moss 1983).

Standards

Cultural standards addressed in this chapter are (Alaska Native Knowledge Network 1998):

A.4: Respects and validates knowledge from other cultural traditions

C.1: Utilizes the local language

C.2: Recognizes the depth of knowledge that is associated with the long inhabitation of a particular place and utilizes the study of "place" as a basis for the comparative analysis of contemporary social, political, and economic systems

C.4: Views all community members as potential teachers and all events in the community as potential learning opportunities

C.5: Treats local cultural knowledge as a means to acquire the conventional curriculum content as outlined in state standards, as well as an end in itself

State standards addressed in this chapter are (Alaska Department of Education 1996):

A.4: Understand observable natural events such as tides ... and moon phases....

A.15: Use science to understand and describe the local environment

B.1: Use scientific processes—observe, measure, interpret, infer, communicate, and predict

D.1: Apply scientific knowledge and skills to understand everyday events

Tlingit Words

English	Tlingit
year or winter	táakw
spring	taakweeti
summer	kutaan
autumn	yéis

Lesson 1: Developing a Local Calendar

Overview

Students will apply their understanding of the moon and tide cycle to create a calendar that incorporates both cycles. This calendar will be used in the next two activities, in which students will add traditional and contemporary uses of a designated beach site and monitor environmental changes.

Material and Equipment

- Examples of calendar types (see example)
- Class data on moon phases
- Calendar showing moon cycles
- Class data on tides
- Tide book
- Blanks of calendar formats

Activity

Begin this activity with a discussion of calendar types—the Tlingit calendar, the Julian (standard) calendar, moon phase calendars, or other subsistence-type calendars. Originally there was no standardized calendar. Cultures throughout the world had their own ways of measuring and tracking the passage of seasons. Native calendars, although depicted in a similar style, followed the moons but were not specific to the number of days per month.

Do students see the discrepancy between a 29.5-day lunar cycle and our standard months, which range from 28 to 31 days?

Today calendars around the world use the same names for months and have the same number of days per month. If you have already talked about the need for standardization of measurement in other lessons, the students should grasp the reason for standardization of the calendar year. If not, this would be a great time to expand on this concept.

Students will devise a calendar that reflects the moon and tide cycles in their area. Their calendars will be used to record coastal resource habitat data for a given area. Students can each create their own calendar, or work in teams to create one calendar.

1. Have students or teams create a calendar format. Provide students with a variety of calendar formats (see example). Students should be able to: (1) record 12 months or one annual cycle on their calendar, and (2) have room to record resource observations that will be gathered in the next two

activities. Based on classroom discussion, students may choose to reformat their calendars before they begin using it.

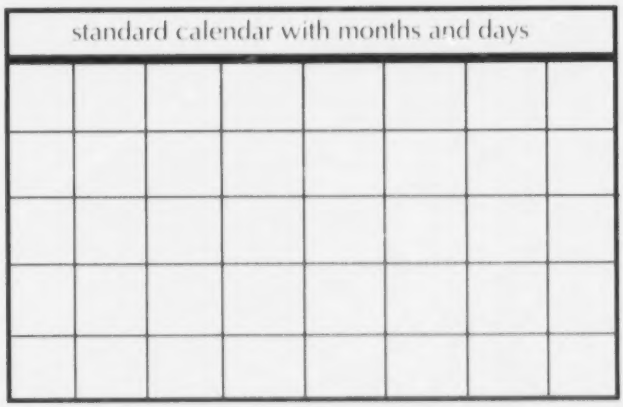
2. Ask them to record for each month:
   - Full moons
   - New moons
   - Half moons

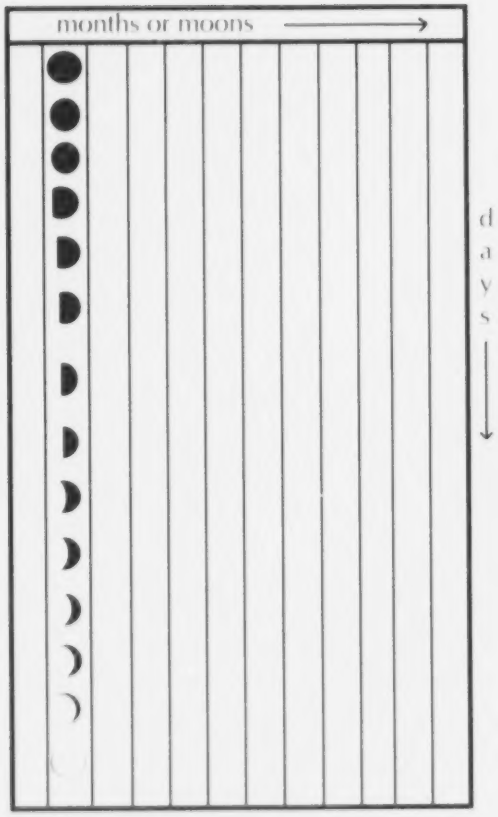
   Have students report their findings. Did they notice the variation in the number of days in each month?

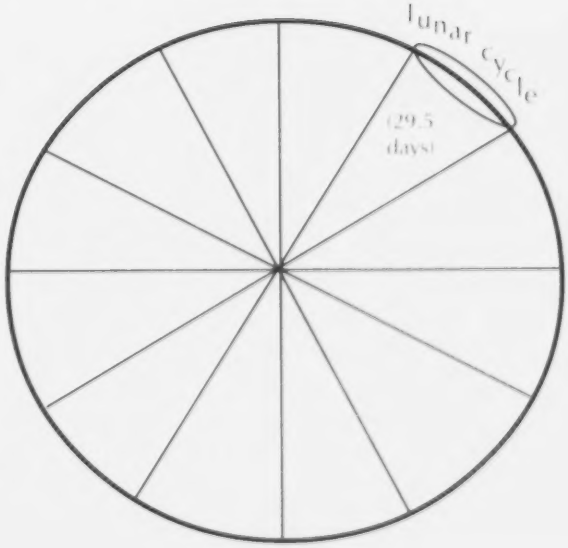
3. Have students add tidal information to their calendars. How much they add will depend on their calendar type (room available for recording information). They may choose to record the low and high tides for each day, or they may record only the most extreme tides for each month.

4. Compare moon phase information with tide information. Discuss relationships.

Calendar Formats







Lesson 2: Cycles

Activity 1: Learning from Our Elders

Overview

Students will participate in a "Walk with Elders" to experience the observation and inquiry process of a culture bearer and to learn traditional knowledge of the environment and uses of the resources. Focus on the elder's knowledge of the habitat and its cyclical changes as well as Tlingit uses of the resource. Students should prepare one question to ask the elder, but they should also know that elders often have their own idea of what and how information should be shared. Be sure to monitor this interaction. This is also a good time to involve parents and other family members who may be interested in participating in the entire project.

Again this is a good opportunity for a student team to videotape or audiotape the event.

Materials and Equipment

- General field trip gear (boots, raincoat, hat, first-aid kit, etc.)
- Journals
- Collection bags
- Plant press

Activity

Review the beach mural from Chapter 3. Based on the beach size and type and the number of students, establish research plots or transects. Ensure that all habitat types found at that beach are covered. Your transects may go up into the tree-beach fringe. The unit size will vary depending on the number of students and the beach area.

Based on the mural and student knowledge of the area, have students individually or in teams pick a specific unit of the area to study. Have students or teams draft a picture of their proposed unit based on memory.

Go on the field trip to a beach area with an elder. Students should spend time at each habitat type—beach forest, beach fringe, upper tidal, mid-tidal, and lower tidal zones. At each site the elder should be given the opportunity to speak to the uses of the resources, including time of harvest, etc. The elder may also discuss why this spot is culturally significant. Students' questions can be posed depending on the receptiveness of the elder.

Students should make another sketch of their specific site while at the beach. This sketch should be specific to plant and

animal type as well as substrate, weather, etc. They can also collect plant or seaweed samples to press.

After returning from the trip, students will write a draft report on their habitat. The report should include a description of the area as well as resource uses by humans and other animals. The visit should be recorded on their calendars.

Be sure to send a letter of thanks and student cards to the elder.

Activity 2: Observing the Ecosystem

Overview

In this activity, students make detailed observations of their site over a period of several months to a year. Chapters 3 and 4 are set up to start in the spring when there are good low tides in the morning. You may or may not want to continue this lesson into the next school year.

At first glance, the idea of setting up a seasonal or year-long study of an ecosystem may seem a bit overwhelming—too much to organize, too many variables. But outdoor investigations (just like indoor activities) take on a rhythm of their own and evolve into a structured class routine with predictable expectations and outcomes. It does indeed take planning, which will need in-season modification, but such planning is well worth the effort in terms of student learning and enjoyment. The enthusiasm and interest generated could fuel your entire science program for the remainder of the year.

If you begin this lesson in the spring, you may choose to have your students study their sites on a weekly basis because the increased photosynthesis will cause major and quick changes in the beach ecosystem.

Materials and Equipment

- Student calendar
- Data collection notebook

Activity

Review mural and discuss major habitat types.

Revisit the study area with students, stopping the group at selected sites. At each site, have students or teams give an initial analysis on their study site. They should report on types and abundance of plants and animals. They should also be able to broadly categorize their habitat type.

Demonstrate how teams or individuals should record animal and plant distribution and numbers and weather conditions. This will ensure consistency in the information gathered, which will be used in the next activity. Have students record data from this trip in their data book. Return to school.

Take students to the beach area on a weekly, biweekly, or monthly basis depending on your capability. Students should report all the information they can in their data book. They will transfer major environmental changes to their calendars in the next activity.

Students should complete this activity by summarizing their observations in a report.

Activity 3: Ecosystem Review

Overview

In this activity, students develop an ecosystem and community map for the beach indicating the variety of habitats, seasonal habitat changes, traditional and contemporary names, and associated resource uses. Students compare their observations with one another to develop a better understanding of the cycles of the beach ecosystem.

Materials and Equipment

- A local person(s) familiar with your beach
- Topographic, aerial, or local map
- Large sheets of paper (3 by 6 feet) for beach profiles
- Felt pens
- Map key (one per team)

Activity

1. As a class, discuss and agree on legends and symbols. The drawn or paper symbols can be keyed by shape and color. Be sure to include key species for each of the types of habitat. Develop key of these symbols on one sheet and distribute to student or teams.

   Draft and date a beach mural for each week or month when data was collected.

   Students should summarize their observations from activity 2 on the correct murals, using the standard legend developed by the class. Each student or team will add data to each of the murals with data collected for that date.

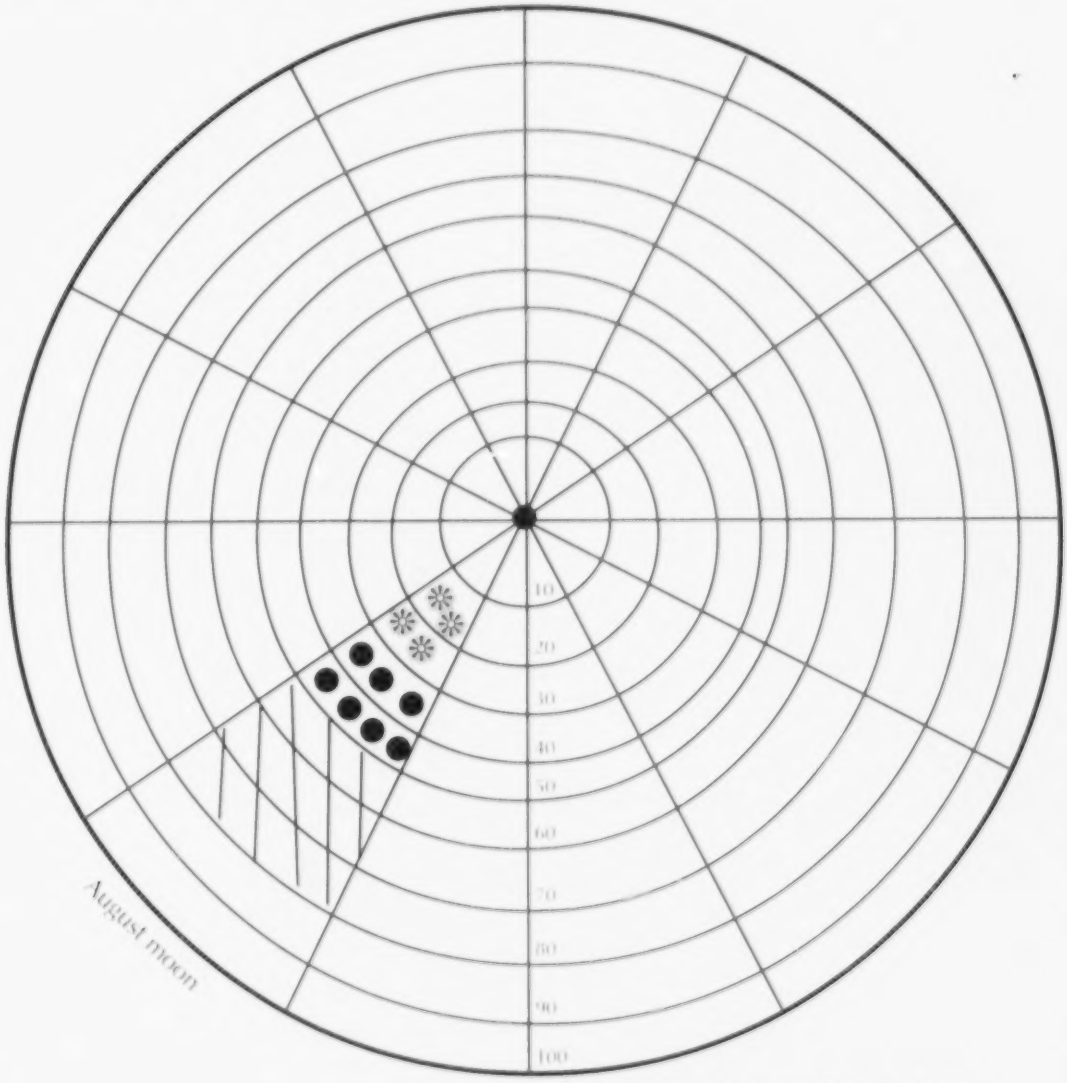
   Assign each student or team to redraw one of the murals based on all of the data submitted. Students should ensure they are using the agreed-upon legends, and redraw to clean up. Students and teams can use data gathered from Chapter 3 and this chapter. Have each student or team report to the class on their findings.

2. For each assigned mural, have students/teams provide the following information:

   - The Tlingit month name
   - Major plant activity for that period
   - Major animal activity for that period
   - Human uses of the resources and area
   - The major weather pattern for that time
   - Tide information (extreme low tides in morning, etc.)

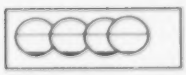
   Students or teams should report on their findings to the class. Reports should be presented in sequential order.

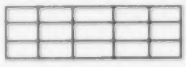
Resource Use by the Moon/Month Example



Percent of time in activity (each ring represents a 10% increment—for a total of 100%)

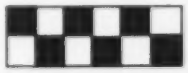
Salmon fishing


Shellfish gathering


Bark gathering

Berry picking

Seaweed gathering


Fur trapping

Medicinal plant gathering

Deep sea fishing

Hunting

3. Based on class reports, students should add major environmental changes and Tlingit resource uses to their calendars. If the students were to rename the month based on their observations, what name would they use (e.g., moon when the beach greens began growing)?

   If the data collected is for less than 1 year, you will need to estimate the environmental changes and uses for the other months. This can be done by bringing in locals or elders who use the area, by class discussion with students who likely use the area, or by bringing in local biologists, etc.

   Students should add this data to their calendars.

4. Students should end up with a calendar that includes moon and tide cycles, plant and animal cycles, and human uses for their beach.

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This book
brings Alaska Native
understanding of science
and ecology to the elementary
classroom, by showing teachers how
to present local and ecosystem
knowledge held by long-time
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America comes to terms with
our dependence on a
healthy Earth.

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